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Masonic Building, Pittsburgh, Pa.
(Gelatine Print issued only with Imperial Edition.)
A Modern Palace, Genoa, Italy.*
The Campo Santo, Genoa, Italy.*
Artistic Hardware.
Building of the New York Life Insurance Co., Montreal, Canada.
Memorial Tower.
Sketch for St. John's Church and Sunday-School, Fall River, Mass.
City-Hall, Los Angeles, Cal.
House at Cincinnati, O.

* Omitted from the issue of last week.

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A MARITIME exhibition is to be held next fall in Boston, which will have a curious interest, particularly in a place which still cherishes, as Boston does, reminiscences of the time when McKay's clippers, Thaxter's instruments, Bond's chronometers and Cape Cod captains carried the fame of New England shipping all over the world. Now the grass grows between the paving-stones on half the wharves in Boston, and the few that find employment, except as landing-places for the little harbor steamboats, are occupied by vessels flying nearly every known flag except the American; but the older men, who still talk with pride of the Forbes rig, and go down every September to see the Burgess yachts sail away from their competitors, will go to the exhibition to see what new American ideas in navigation are waiting until the law will allow them to be put in practice; and the younger ones, who have seen their countrymen for twenty-five years shut out from maritime industries, may feel a scientific interest in studying the effect which an hour's hasty legislation may have on the destinies of millions of mankind.

A PARTICULARLY pleasant piece of good fortune has befallen the profession in Philadelphia. Mr. Joseph Donath Koeckkler, a retired architect of the city, died recently, leaving an estate valued at more than twenty thousand dollars in trust, a portion of the income to be paid during her life to the woman who nursed him during his last illness, and the rest to be allowed to accumulate for seven years, at the end of which the entire net income is to be paid over forever, in semi-annual instalments, to the Philadelphia Chapter of the American Institute of Architects, or their legal successors, "for the promotion of the science of architecture." The will specifies that the money shall be devoted to paying the salary of a lecturer on architecture, the purchase of books, and the awarding of prizes in the manner that may seem to the officers of the Chapter "most conducive to the object of improving the architecture of buildings in the city of Philadelphia." It is rather fortunate that the officers of the Chapter will have time enough to mature a plan for expending the money to the best advantage before it comes into their hands. At compound interest for seven years, the principal ought to accumulate sufficiently to produce a revenue of something like two thousand dollars a year, which will go a good way toward encouraging and instructing the young men who are to be the future custodians of Philadelphia architecture, and it is, by the way, rather fortunate that the American Institute of Architects, with its chapter organization, has not ceased to exist in the professional agitations which have been going on for the last two years. If there is ever any advantage in uprooting the product of years of experience and clearing the ground for an entirely new crop, it is certainly not found in the case of professional societies, which accumulate honor and dignity as the years go by, and, as we see, often begin, after they arrive at a certain age and respectability, to accumulate more substantial assets.

THE people who hold stock in companies for supplying water to towns ought to be encouraged by the account of the recent sale of a share in an English company of the kind. The property sold was a single share in the New River Company, which was originally formed in or about the year 1612, for the purpose of digging a canal to bring water from some springs in Hertfordshire to reservoirs in London, for the supply of the district about Clerkenwell. The canal, which was about forty-two miles long, was dug, and is still in use, but the enterprise ruined its projector, and the shares in the company, which were originally issued at five hundred dollars each, were sold for thirty years after the completion of the work for twenty-five dollars each. After that time, thanks, perhaps, to an arrangement by which the London water-supply companies agreed to restrict themselves each to a certain territory, the business began to improve, and the shares became more valuable. The managers of the company acquired or improved land both around their springs in Hertfordshire and in the neighborhood of their reservoirs in Clerkenwell, and their rents from land, as well as their income from sales of water, increased. About thirty years ago shares were sold at forty-five and fifty thousand dollars each, after having paid a good and constantly increasing interest for two hundred years, and two or three weeks ago a single share was sold at auction in London. The auctioneer, perhaps prudently, made no reference to the early history of the property, but mentioned that this single share brought in last year an income of thirteen thousand dollars. The first bid made was four hundred thousand dollars, and after a rapid succession of offers, increasing by five thousand dollars at a time, the share was sold to an insurance company for six hundred and fourteen thousand dollars.

THE history of the Paris Exposition, which *Le Génie Civil*, as the official literary representative of the affair, gives from week to week, presents some curious facts in regard to the plate-glass and mirror manufacturing establishment of Saint-Gobain. This may be said to be the oldest establishment of the kind in the world, as it descends directly from the manufactory set up in Paris, under the special favor of the King, in 1665. The original company was formed by Nicholas du Noyer, with the intention of importing workmen from Murano, then the only place in Europe where mirrors were made, to teach the French workmen the business, and among the favors which were granted by the King in recognition of the importance to his subjects of the introduction of so useful an art was the permission, extended by royal decree, to all noblemen and gentlemen to become stockholders in the company "without derogating from their nobility," besides the valuable and inexpensive privilege of writing "Manufacture Royale" on the sign-boards of the company, and the more substantial one of exemption from the jurisdiction of the courts, so that an agent or servant of the company could only be sued or tried before the King's Council. The first glass factory was set up in Paris, but a few years later the company entered into relations with a noble family of Normandy, which had set up a small shop for glass-blowing, then a new art in France. The association with the de Nehou family, which seems to have been an ingenious one, was permanent, much to the advantage of both parties, and in 1691 Louis de Nehou succeeded in making the first large cast-plates, which were silvered by the process in use then and presented to the King. The success of the experiment rendered it necessary to prepare for carrying on the process at a larger scale, and the ruined castle of Saint-Gobain, with the domain attached, was bought from the Crown, and the manufacture established which has been carried on without interruption ever since. In 1702, a new company was formed under a more advantageous charter, and the business of the original company was transferred to it. The by-laws of the new corporation contained some curious provisions.

All the stockholders bound themselves solemnly to contract no loans, and to contribute to the expenses of the business by assessments proportionate to the value of their stock. The rate of dividend was set at ten per cent, with a small fixed return per share in addition, and the stockholders were paid two shillings for attendance at meetings of the company. Under the direction of Louis de Nehou, the manufacture was carried on with increasing success, and soon after his death the charter of the company was renewed for thirty years, with all its privileges, one of which was the right to seize upon and appropriate to its use any materials suitable for its manufacture, wherever they might be found in France.

DURING the Revolution, the company went through a few trials. It had then come into the hands of some great nobles, joined with a few rich Parisian bourgeois, and Geneva bankers, but the new régime was too practical to strangle the affair all at once, so the Government contented itself with cutting off the head of the treasurer, and confiscating his property, together with that of the noble stockholders who had fled from the country to escape a like fate, and claiming a representation on the board of directors in virtue of the certificates of stock found among the plunder. Notwithstanding the lack of harmony which might be expected to exist between the old directors and the new ones who held office by such a tenure, the former did not dare to make any difficulties, and the business went on with increasing prosperity for forty years longer, when the company was reorganized, to bring it into conformity with the modern theory of manufacturing corporations. At that time, in 1830, when the property was transferred from the old company to the new one, the accounts were overhauled from the beginning, and although for a hundred and twenty-eight years they had never been audited, or even read or shown to the stockholders, they were found in irreproachable order. At present, the establishment has spread over several towns, and employs about thirty-five hundred workmen. Immense improvements have been made in the processes, so that a large sheet of silvered plate-glass costs now only about one-third as much as it did in 1873, and little more than half as much as it did in 1884. The casting and polishing are done in the same manner as in the earliest days of the manufacture, but the work is done by machinery, and the long practice has made the workmen very expert in the processes which are still left to manual labor. Every year the size of the plates which can be successfully handled increases. At the Exposition of 1878 was shown a mirror measuring thirteen and one-half by twenty-one feet, but in the present exhibition is a mirror twenty-five feet long and thirteen and one-half feet wide, besides a sheet of unsilvered plate-glass thirteen and two-thirds feet wide, and nearly twenty-seven feet long.

THE *Sanitary Inspector* makes a striking comparison between the yellow fever epidemic of last year in Florida and the diphtheria epidemic of the succeeding winter in Boston. In Florida, in a population of rather less than four hundred thousand, there were about four thousand cases of yellow fever, and three hundred and fifty of the patients, or less than nine per cent, died; yet the progress of the disease was, while it lasted, the most engrossing subject that newspaper reporters all over the world could find to talk about, and persons who ventured within the boundaries of the State were looked upon as heroes, while the final disappearance of the disease was hailed with universal rapture. In Boston, with a population of about four hundred and fifty thousand, there were, within the next few months, about fourteen hundred cases of diphtheria, and four hundred and seventy of the sufferers died, or, to put it in another way, during the winter following the yellow fever epidemic the mortality from diphtheria in Boston was greater, in proportion to the population, than it was from the fever in Florida; yet instead of quarantining themselves against the rest of the world, or rending the heavens with their prayers and wails, the people of Boston in general took only the most languid interest in the whole matter, unless the disease attacked their own families, and the health authorities, while they carried out their duties faithfully, were very far from trying even the methods for checking the epidemic which have already proved so efficient in two other cases in this country, and still farther from exercising the zeal and ingenuity in devising new prophylactics which was shown in Florida. The result was that the number of fatal cases of fever, compared with the number of persons attacked, was, we believe, by far the smallest ever known in the history of the disease, and the Florida health authorities may fairly claim to have despoiled "Yellow Jack" permanently of half his terrors, while the diphtheria epidemic in Massachusetts was as fatal as those of the dark ages of sanitation, and the people of the most intellectual State in the Union must confess that, even for the sake of saving their children's lives, they, or their delegated representatives, were incapable, not merely of inventing new weapons against the enemy, but of using those which recent sanitary experience in the West offered them. In some places in the North, any farmer on whose farm a thistle is found growing is obliged to pay a substantial fine. The causes of diphtheria, and the means for preventing its appearance, are as well understood as the methods of extirpating thistles, and we hope that the time is not far distant when the occurrence of a case, not only of diphtheria, but of scarlet fever, will involve the community in which it occurs in a heavy penalty, and will make the authorities who manage the State medicine for that community uncomfortable for some time afterward.

THE *Builder* gives an account of the early life of the late Sir James Picton, of Liverpool, which is not without its moral for architects who imagine that success in professional life is generally the result of making half-a-dozen startling sketches, and getting intimate with a newspaper reporter. Picton left school at the age of thirteen, to keep books in his father's counting-room. When his father died, not long after, he was left without resources, and almost without friends. A place was offered him in the office of an architect and surveyor, Mr. Daniel Stewart. He accepted the position, and set about making himself as useful as possible to his employer. By working hard he soon gained a knowledge of the office business, and spared no pains to do his part quickly and intelligently. When his salary was advanced to twelve dollars a week, he married, and then redoubled his efforts, not only to earn his income, but to put himself in the way of having it increased later. He would often leave his house at two or three o'clock in the morning, to get through some piece of surveying in the country, and, after taking what notes he needed, appear at the office by nine o'clock ready for the usual work of the day. In the evening, after going home, he would take the notes of his morning survey, work out his figures, and write his report, or otherwise present his results in form for use. By this sure process, he became indispensable to the business, and when his master died he succeeded to his practice as a matter of course. Just as he began to take up the full responsibility of the business, a fashion of building costly mercantile structures began to prevail in Liverpool, and his industry and natural cleverness made him one of the most successful designers in the new style. As he advanced in years and experience, his services came into great request as an expert and referee, particularly in cases where new railways were concerned, and the clearness with which his conclusions, and the reasons for them, were stated, and the firmness with which he adhered to them through any amount of cross-examination, gave him authority all over the kingdom. Naturally, so much responsibility was well paid, and he became rich, but continued to the end of his life the industrious habits in which he had trained himself. Like most clever men in England, however, he took up a hobby in his later years, which divided his attention with his business. The hobby in his case was archæology, particularly that of his native town, and he became a distinguished authority on the subject publishing many books and papers on this and similar matters. Next to archæology, his chief pleasure was in works of public advantage, and he was active in every kind of public charity. A few years ago he was knighted, in recognition of his services to his fellow-citizens, and on his death the flags on all the public buildings in Liverpool were displayed at half-mast.

AN organ has recently been put in the City-hall, at Sidney, Australia, which has the pedal pipes sounding C sixty-four feet long. These give a note two octaves below the lowest C in an ordinary piano, which has the slight disadvantage of being inaudible, as it produces only eight vibrations of the air per second. Why any one should wish to go to the expense of putting pipes in an organ to cause movements of the air which cannot be heard is not very easy to understand, but it seems to be thought that the slow movements of the air, although themselves imperceptible, give depth to the notes which are sounded in harmony with them.

BUILDERS' HARDWARE.[1]—XXX.

ARTISTIC HARDWARE.

Fig. 471. Shutter-bar. Yale & Towne Mfg. Co.

THE manufacture of fine hardware for house-trimmings has by no means kept pace with the artistic development which this country has witnessed during the past fifteen years in nearly every other branch of the art industries; so that while the mechanical details of the wares have been brought to the highest degree of excellence, the manufacture seldom rises to the dignity of an art, and seems to be considered in general as requiring no further direction than can be given by the most skilful mechanics. A trained designer, who would treat hardware as a part of a house rather than as an opportunity for mechanical elaboration, who would appreciate the relation it necessarily bears to the architecture, who would consider the fitness of the material for certain forms and the adaptability of certain styles for certain uses, without attempting to combine an Albert Durer cartouche with an Italian Renaissance scroll, crown the product with a Greek honeysuckle and apply the whole to a design for a door-plate, would have chance for employment with but few of the large firms which supply the market with builders' hardware. Consequently we find that while there is a considerable quantity of perfectly plain, unadorned hardware which is good because of its simplicity, the elaborate hardware is nearly always bad, and unfortunately most hardware is elaborate. These conditions are by no means wholly due to the indifference or artistic incapacity of the manufacturers. It is found that cheap patterns sell the best; a fussy, meretricious design is the most profitable to put on the market, and the producers are obliged to cater to the cheap trade. There are a few exceptions to this rule, some manufacturers whose average artistic productions are unimpeachable, but when such have made money it is due more to good business management and mechanical perfection than to artistic capacity. The public buys hardware because it is well-made and reliable, rather than because it is good-looking. At the same time, even the best is disappointing, because being so good, it ought to be a great deal better. With so much to draw from — the wealth of ideas in the European museums, suggestions in silver and gold smith's work, the old Pompeian bronzes, the delicate, antique Etruscan jewelry, besides the quantities of architectural ideas which might be adapted; and having in addition the best of mechanical workmanship, together with the element of color, which the work of former times seldom possessed, the hardware designer ought never to be at a loss what to do. No one of the art industries is capable of so wide an æsthetic expansion or presents so varied a field for the play of individual fancy, and few have been so persistently misapplied and misunderstood. It is not fair to say there is no good hardware to be had unless it be specially designed, but the general average of the goods which are kept in stock by the leading manufacturers, is, to say the least, commonplace; and this, too, notwithstanding some very notable exceptions.

At one time, iron was almost the only material employed for artistic effects in hardware. This was before the day of patterns, when the individual fancy was applied directly to the metal. But now, when the artist has ceased to be the workman and an article is salable only when it can be readily reproduced, cast brass and bronze are almost the only metals used. Quite recently cast-iron has been employed to a considerable extent, and when finished with the Bower-Barff process, sells at about the same prices as bronze. A defect in nearly all cast-work, however well-designed, is that the patterns, instead of being modelled by hand, so as to show every touch of the artist and permit of an exact reproduction of the feeling which a design should have when worked out in a metal like bronze or iron, is first carved in wood. One who does not appreciate the difference between a carving and a casting, has only to compare a Greek *stèle* with some of the exquisite bronzes which are taken out of Pompeii; and no workman, however skilful, can give a wood-carving the easy flow and metal-like appearance of a bronze casting. Again, our castings are, in one sense, too nice. That is to say, after they are taken from the mould they are pickled in acids and then hand-chased, a process that could spoil even the best of modelling. It is to be hoped that some day fine hardware will be cast only by the *cire-perdu* or some similar process, which reproduces every touch of the artist and leaves the casting perfect as it comes from the mould.

Glass is used more now than it was a few years ago, and for knobs is peculiarly suitable. It is not usually exhibited by the manufacturers as artistic hardware, though surely when such ugly faceted abominations are tolerated in cut-glass tableware, a cut-glass knob ought to please every one.

A rather interesting change has taken place in the forms in which artistic designs in hardware are expressed. During the Middle Ages, the greatest amount of work was expended upon the hinges and their accessories, an example of which is afforded by the hinges of the western doors of the Cathedral of Paris. Knobs and latches were quite subordinate; indeed, knobs, as we apply them now, were unknown at that time. During the Renaissance period the ingenuity of the artisans was devoted to locks and keys, some of which are most surprising examples of hardware. At present neither hinges nor locks nor keys are elaborated to any extent, the greatest amount of thought being given to the door-knobs and the plates by which they are secured to the woodwork. In collecting the samples which are illustrated in this chapter, the various manufacturers were requested to indicate which of their goods they considered as most typical of their artistic possibilities; and out of some fifty pieces so designated, all but three were door-knobs. This might be considered as indicative of a belief that knobs alone are susceptible of artistic treatment, though, in reality, there are plenty of well-designed pulls, butts, etc.; but it shows that the popular taste, when craving for art, looks at present no farther than the door-knob. And yet the first impulse of nine out of ten designers would be towards ornamental hinges rather than elaborate knobs, though with our present forms of butt-hinges there is little opportunity, and no real necessity for the long-strap hinges which form such a delightful feature of the old-fashioned doors and casement-windows. Butts are cheaper, more easily applied, and for some styles of work are more suitable, still one rather regrets the opportunities which the old style of hinges afforded.

Artistic hardware usually implies an unnecessary expense to the minds of most buyers, and unfortunately the implication is a correct one, even with very simple designs. The perfectly plain bronze, which is so much in favor in some parts of the country, is more expensive than any of the mean, contemptible figured-bronze goods which form the stock of nearly every hardware store. Plain bronze must be perfect, as every imperfection will show, whereas a criss-cross pattern will hide a multitude of sand-holes and imperfect casting. Until the general average of figured-bronze goods is higher, the architect will, therefore, have considerable difficulty in persuading his client that artistic hardware is worth all it costs. Still there is plenty of good, plain hardware which is within the means of most clients, and the aggregate cost above what the common figured work would be, is quite inconsiderable for an ordinary house. A difference of two dollars per pair on knobs would not amount to more than fifty dollars on an entire house, and the enjoyment of seeing well-chosen hardware about one's home is surely worth more than the interest on fifty dollars, or twice that sum. We, as a nation, are fast appreciating the fact that beauty is worth more than mere utility; and when the public taste demands a better average quality of house-hardware, there will be no lack of proper artists to furnish the right kind of supply.

Comparisons are always dangerous, and are apt to be invidious. There are upwards of a hundred firms in this country who make a business of supplying hardware in one form and another. It would be impracticable, were it desirable, to fairly represent the work of any considerable portion of this number, nor is it necessary in order to show the state of the market. Accordingly, a limited selection has been made from the goods of a few of the manufacturers whose reputation for fine work is not questioned, and the pieces illustrated can, at least generally, indicate what are the market possibilities. It was intended that the selection should be left to the manufacturers, so that the samples would in a measure indicate their own views as to what constitutes good hardware, but this idea was only partly carried out, it being necessary to make some personal selection so that the illustrations should not be confined entirely to knobs.

[1] Continued from page 47, No. 710.

1. The Yale & Towne Manufacturing Company. Figures 457, 458, 459 and 460 [See Illustrations] are all executed in Bower-Barffed iron. The first design, while not particularly handsome, is thoroughly appropriate to the material and would be suitable for the inside door of a public building, though rather heavy for a dwelling and not heavy enough for an outside door. The knob is perhaps a little too suggestive of wrought-iron. The next example is in a style which might be used to advantage for hardware, much more than it is, though the fish scales in the ground about the key-hole are not altogether appropriate to hardware. The next design is intended for a front door. The foliated pattern, Figure 460, is one of the best which has been made in this material. The design is well arranged and worked out, and excepting the smoothness of the surface,

Fig. 461. Door-knob. Yale & Towne Mfg. Co.

Fig. 465. Bell-pull.

which is too suggestive of the carved pattern, it is very satisfactory. Bower-Barffed iron hardware makes a very effective finish for either oak, or white paint, and has the advantage of not changing its tone with age. It is unfortunate that the illustrations cannot give an idea of the color of these samples, as with some it counts for nearly as much as the form.

Figure 461 is a very daintily designed knob and escutcheon, finished with gold-plate, the plain surfaces being slightly dulled, and the raised portions polished so as to give brighter reflections. Another knob is finished in one of the most durable colors that is given to bronze hardware, known as old brass, having the soft yellow of an old binnacle which has been scoured and rubbed down year after year to a smooth dull but not polished surface. The big nail-heads studded over the escutcheon are very effective. Figure 461 would be suitable only for the most elaborate room, preferably one finished in ivory-white and gold, while the old-brass design would answer for much humbler apartments, looking best against dark oak, mahogany or white.

Figures 463 to 467 inclusive, are all in bronze. Figure 465 is a bell-pull, finished in deep copper color. The knob is especially well designed both for looks and for wear, the numerous rows of beads hiding any inequalities of tone and giving a rich effect at slight cost. Figure 467 is for inside work. The three others are for front doors.

Figure 468 is an elaborate drawer-pull in silver-plate, slightly oxidized. Figure 469 is in bronze, copper-plated and oxidized, the high lights being buffed down to show the copper. The design is made to match the iron escutcheon Figure 460. The shutter-knob, Figure 470, is a very neat design in a semi-Greek style which we ought to see used more frequently. The sample is gold-plated. The shutter-bar, Figure 471, the lock and key, Figure 472, and the hinge, 473, are all carried out in the same semi-Byzantine style, in oxidized-silver. The key is unique, and the only one of its kind found in modern work. Few persons would care to go to the expense implied by such keys and lock-plates, but where the money is not an important consideration, it would surely add to the finished effect of a room to have such keys as this in the lock instead

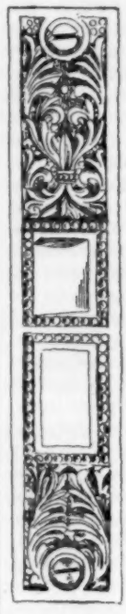


Fig. 470.

Fig. 472. Oxidized-silver Hardware. Yale & Towne Mfg. Co. Fig. 473.

of the flat utilitarian structure one is usually content with. Figure 474 is a number-plate in oxidized-copper, the leaf work showing in dull copper tones against a very dark old-bronze ground. The number is gold-plated.

The Yale & Towne Manufacturing Company has made its name chiefly on its locks, but of late years it has included the manufacture of fine hardware. The work done by it is excellent in finish and mechanical details and the foregoing samples fairly illustrate the character of the designs.

[To be continued.]

AN ARCHITECTURAL KNOCKABOUT.[1]—IV.

FROM Naples I went to Pompeii, after having procured permission from the Italian Government to make sketches there. The government is very strict in this respect, and I had a hard time in procuring these permits. I had no passport, but, on exhibiting the only documents on my person which looked important, namely, my letter-of-credit and my visiting-card, I accomplished my purpose. I found that the Italian officials seemed to think that a letter-of-credit on any of our banks had as much significance as the "glorious eagle" on the *bona-fide* passport. However, after having proved conclusively that I was an architect by my sketch-books, and in spite of my having been caught making a caricature of a blustering old officer, I was at last successful, and prepared for my visit to the dead cities, Pompeii and Herculaneum. Naples, architecturally, was totally devoid of interest to me, and that is not to be wondered at with Rome, Pompeii, Herculaneum and Pæstum so near at hand—all replete with such wonders.

Arriving at Pompeii, at a little bit of a station made of lava-stone, I asked a good-looking brigand where the Albergo del Sole was. He offered to pilot me. I said I only wished to be informed of its whereabouts. Nothing would satisfy him but to walk by my side, repeatedly begging me to allow him to take my knapsack, but without success. I arrived at this little hotel, which was built, I should say, entirely of cement.

The old "padrone" was a queer specimen of a man. He wore a red Tam O'Shanter and spoke good French, but not a word of English. All the travelling artists stay there. I was shown to my room (a great square tomb of a thing, and cold as "Greenland's icy mountains"). It contained a cot-bed, placed directly in the track of a flow of lava from old "Vesuve," whose fires I could see from the window of the establishment. I discovered, also, that the walls were all decorated by the different artists who had been there, with

[1] Continued from No. 710, page 51.

their names attached to their work — Pompeiian scenes, caricatures and what not! I was asked to do likewise, and to this day, I suppose, on the east wall of this room, is a humble sketch of mine, descriptive of some Pompeiian scene, and I should have always a peculiarly happy feeling if any one told me he saw it there. The

The Albergo del Sole, Pompeii.

padrone and I soon became great chums; indeed, he took a fatherly interest in me, and warned me against temptations of all sorts. I was never to go out after dark, and by all means never to wander far alone in the direction of Pæstum, far-famed for its brigandish disposition. I promised to be careful.

The next day, I, with several Americans and English who had lately arrived, made the ascent of Vesuvius, riding to the very base of the old furnace, and then walking the remainder of the way. We were met by various guides, who offered in a pitying tone their ropes to aid us in our ascent, saying that we looked tired. We refused them indignantly, but were all the time dying to grasp hold of these friendly aids, just the same.

What a climb! Every two steps we took in the ashes we would slip back one. Arrived at last at the summit, we had luncheon, and examined the crater with its sulphuretted mouth and poisonous breath. Again and again it would heave and send up showers of small stones and soft lava as it did in the time of Pliny.

We walked for about twenty feet into the mouth of the crater with our handkerchiefs tied over our mouths. It looked very mighty and grand, and as one looked down and saw continually the flash of that dangerous flame indicative of subterranean fires, and walked from rock to rock in order to avoid the still flowing lava, one felt anything but comfortable. It was with no small feeling of relief that I commenced the descent of the mountain by the way known as the "ash path." Here, at a signal from our guide, we commenced to trot; the trot soon turned into a run, and from that to continual flying leaps, landing us up to our knees in the soft ashes below. Notwithstanding all this, the descent was glorious fun. The air was very clear, and kept us so buoyed up that we felt no fatigue. Our descending leaps were so tremendous that we simply flew straight out into the air and landed far down the side of the cone. It was a queer sight to see all of us rushing like mad down the mountain-side. There was no such thing as stopping, and in less than five minutes after we started we were at the bottom. It is only superfluous to try and describe the ascent and descent of Vesuvius. We've had it in all its forms, so I'll to Pompeii.

Most travellers take one day to make the ascent of the mountain and half a day to go over the ruins of Pompeii, and then "clear out" as fast as they can. I did not follow this example because the place itself had the greatest attraction for me; so much so that I concluded to stay there a week. This arrangement enabled me to make a great many sketches.

On speaking to the padrone, he informed me that, as I was an artist, the price of living there would be but three francs a day if I stayed a week. This had its effect, and I decided to remain. Like everybody, I am fond of a horse, and although the poor little beasts that carry a man up Vesuvius cannot, with any due respect to that noble animal, be called horses, still I decided to hire one of these apologies for the week I was at Pompeii. On asking the price of a pony for the time I contemplated remaining, I was informed that I could have one for ten lires, or two dollars of our money. This was almost startling, and I closed the bargain at once.

Each day I would rise early, eat my breakfast and have put up a lunch of great "hunks" of bread and chicken, and, with my sketch-books and bottle of wine strapped to my back, would fling my leg over my little quadruped and start off for a day's wandering. I soon became known to the people (probably by the queer figure I cut). I would go each day all around the country: now to Torre Annunciata, then to Herculaneum, Castleamara and Sorrento — each day by a new and strange route.

The padrone had again cautioned me not to ride towards Pæstum, and I had given him the impression that I would not, but on the last day of my stay there I decided to reach Pæstum or die. As for the talk of brigands, it did not bother me at all.

I had a love of adventure, and to go to Pæstum and be accosted by a real live brigand in these nineteenth-century days had a charm not to be easily shaken off. So giving orders for the preparation of my luncheon for the next day, and that my charger should be curried

My Pony rests.

and fed with an extra centime's worth of oats and brought around to my quarters at an extremely early hour, I retired. Awakened at four o'clock, I sallied forth in the glorious morning, no one suspecting my proposed destination. I rode all day, stopping now and then to make a sketch. My little beast was only too ready to be quiet, and would sleep away an hour or so, standing stock still all the while. This was no wonder, as he was so small that my feet nearly touched the ground. I want to say one thing about that animal: his one great fault (which he often indulged in) was to stop at any stump or convenient boulder and deliberately sit down upon it. I always had to wait until he was sufficiently rested to continue. About four o'clock in the afternoon I neared the vicinity of the temple of Neptune. It was getting late, and I thought I saw it from a hill whose summit I had reached. Having gone through a mile or two of dense Italian woods, I stopped to cut a stick to accelerate the movements of my steed, and then decided to go back to Pompeii, as it was so late that even with my greatest speed I could not arrive at the Albergo del Sole till nearly eleven o'clock. I then began to realize for the first time my position. No one was near me; no one of my

friends knew where I was; what would prevent my being "laid out" here by some kind band of brigands and thrown into a bush? And who would have been the wiser? In this way I worked myself into a squeamish state of feeling and resolved to "put" for home. Acting upon this intention, I had dismounted and was emerging from the bush where I had been cutting the stick above mentioned when, to my surprise, and, I must say, trepidation, a live wood-chopper or brigand strode calmly forth from the dense copse close by. He had evidently been chopping fagots, as a great bundle of sticks was under his arm.

I suppose that he had watched me from his ambuscade, and seeing that I was alone and apparently an unarmed foreigner — also looking small and harmless in my knickerbockers — thought he had a great catch. I politely wished him "good-evening" and walked towards my pony. So did he. "Now," I thought, "if there were any chance that by jumping on the poor little beast's back and digging my heels into his sides I could 'cut and run,' I'd do it." But, as the pony was so sleepy and used up, there was no "run" in him, I gave it up as a bad job, and resolved to await events. I was smoking the old pipe I had brought with me from home, and which gave me the appearance of a certain amount of unconcern. I knew something had to be done at once, so I determined to take the bull by the horns. I pulled from my pocket one of those sinful rat-tail-like cheroots from which you have to pull the greater part of a whisk-broom before you can smoke it and gave it to him. He smiled, took

it and lighted the same. I wondered why he didn't go home. Then he, evidently wanting to make his task as short as possible and as agreeable to me as he could, said in honeyed words — not moneyed ones — "*Aura*," which, interpreted, meant my worldly possessions. Ah! it had come. I replied in my best Italian that "*aura*" was a thing of the shadowy past with me, and that I was without a sou. This made him impatient, and, seizing the bridle of my pony, who blinked at him again kindly, he repeated his demand. I again refused and resolved to be bold, frightened to my wit's end all the time. So I started towards him, whereupon he transferred his grasp from the pony's bridle to my collar and commenced a sort of Italian garrote. This was fearful, so I politely asked him to let go. My breath was fast leaving me. He was so near and so easy to hit that I struck him in the old place — the under-jaw — and knocked him down. I was terrified at what I had done. I stood "stock-still," with my hands clinched at my sides and my pipe in my mouth.

To this day I have the dear old thing, with a hole bitten clean through the stem. Then the villain jumped up and with a most awful look tore open his coat and seized his great tree-knife. I fastened a gaze upon him in which I flung every muscle of my body, if such a thing were possible. As he sprang savagely at me my own dear home came before me in an instant. I offered, however, no show of defence, for what was the use, I argued. If I ran, I would surely be cut down or struck from behind. I probably did the best thing under the circumstances — I steadily watched him. He approached me nearer and nearer with his murderous-looking weapon raised aloft, but stopped as suddenly as he had started, his knife being but a few inches from my breast; then, with a most awful curse, he turned and rushed back — back through the woods from whence he had come.

Silently I walked to my horse. I bowed my head on the saddle and sobbed like a child for fully ten minutes. It was a terrible strain upon my nerves. I then mounted the little animal and went slowly home. It was nearly morning before I arrived back in Pompeii, and my friends had become greatly alarmed at my prolonged absence and had sent messengers to look for me everywhere. I said little or nothing in explanation, except that I was delayed by the rain, which had been pouring all the night. I was not myself for a great many days after this adventure, and have thanked Heaven a great many times for that lucky something (whatever it was) that made my brigand postpone his carving process.

F. L. V. Hoppin.

[To be continued.]

The Illustrations

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

MASONIC BUILDING, PITTSBURGH, PA. MESSRS. SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS, BOSTON, MASS.

[Gelatine Print, issued only with the Imperial Edition.]

A MODERN PALACE, GENOA, ITALY.

THE CAMPO SANTO, GENOA, ITALY.

THIS and the above mentioned plate were to have been included in the last issue as illustrations of the "Architectural Knock-about," then published; but this was prevented by an unavoidable mishap which occurred at so late an hour that we could make no explanation or apology last week.

ARTISTIC HARDWARE, MANUFACTURED BY THE YALE & TOWNE MANUFACTURING CO., STAMFORD, CONN.

For description see article on "Builders' Hardware," elsewhere in this issue. It should be noted that, for the sake of making these several articles balance better in the combination as printed, Nos. 458, 459 and 460 have been printed upside down.

BUILDING OF THE NEW YORK LIFE INSURANCE COMPANY, MONTREAL, CANADA. MESSRS. BABB, COOK & WILLARD, ARCHITECTS, NEW YORK, N. Y.

This building on the Place d' Armes is built of red granite up to the water-table and above this level of Gatelawbridge Scotch red sandstone.

MEMORIAL TOWER. MR. ARTHUR TRUSCOTT, ARCHITECT, PHILADELPHIA, PA.

This design was submitted in one of the competitions of the T-Square Club and received a first mention.

FIRST SKETCH FOR ST. JOHN'S CHURCH AND SUNDAY SCHOOL, FALL RIVER, MASS. MESSRS. WHEELWRIGHT & HAVEN, ARCHITECTS, BOSTON, MASS.

CITY-HALL, LOS ANGELES, CAL. MESSRS. HAAS & CAUKINS, ARCHITECTS, LOS ANGELES, CAL.

HOUSE FOR A. H. HINKLE, ESQ., CINCINNATI, O. MR. H. E. SITER, ARCHITECT, CINCINNATI, O.

SAFE BUILDING.[1] — XXXII.

IN Table XXIX the writer has attempted to classify systematically the various kinds of iron and steel used in buildings. The table has been largely based on a similar table prepared for the *Stevens Indicator* by Mr. William Kent.

Classification of Structural Iron and Steel.

Manganese is frequently used instead of carbon to harden steel, it hardens it considerably (though not so much so as carbon) and does not reduce its ductility as much as carbon.

Chromium and tungsten are added to and produce very hard but yet ductile steels, but add considerably to the expense. Chrome steel being used largely for fine tools and vault-works. While cast-iron can be melted at 2732° F. and cast-steel at 3500° F., wrought-iron is practically not fusible. By adding, however, some ½ to 1 per cent of aluminium to wrought-iron its point of fusion is reduced some 300° to 400° F. and it becomes practicable to melt it. This is done in crucibles of fire-clay or plumbago and in petroleum furnaces. The product is a comparatively new metal and known as *mitis*. Its resistance to tension is about one-fifth greater than that of wrought-iron, while its ductility is about the same.

Mitis.

In "*Notes on Building Construction*" is given such a very able short résumé of the difference between cast and wrought iron and steel, that it will be given here with but slight modifications.

Resume of Qualities.

"The great differences in the characteristics of cast-iron, and wrought-iron and steel, are briefly recapitulated below, and these determine the uses to which they are respectively applied.

"Cast-iron has little tensile strength, but affords great resistance to compression.

Cast-iron.

"It is hard, brittle, wanting in toughness and elasticity, and gives way without warning, especially under sudden shocks or changes of temperature. It is easily melted and run into various shapes.

"The castings thus produced are liable to air-holes and other flaws, which reduce their strength. Small castings are stronger in proportion to their size than large ones." Castings should be of even thickness throughout and all sharp angles should be avoided.

"Cast-iron can be cut or turned with edge tools, but is not malleable either when cold or hot, nor is it weldable.

"It is not so easily oxidized in moist air as wrought-iron. In salt water, however, it is gradually softened and converted into plumbago.[2]

"Cast-iron is peculiarly adapted for columns, bedding-plates, struts, chairs, shoes, heads, and all parts of a structure which have to bear none but steady compressive strains; also for gutters, water-pipes, railings, grate-fronts, and ornamental work of nearly every description.

"It has been much employed for girders, but is an untrustworthy material for those of large size, or in important positions. It is liable to crack and give way without warning under sudden shocks, and also under extreme changes of temperature, such as occur in the case of buildings on fire, where the girders may become highly heated, and then suddenly cooled by water being poured on them." For lintels of short span it is used on account of the ease of adapting it to any condition. The main objection to the use of cast-iron

[1] Continued from page 55, No. 710.

[2] Or dissolved.

is its brittle and unreliable nature, danger of flaws, and danger of snapping in case of fire and sudden cooling by a stream of water.

Malleable Cast-iron.

"Malleable cast-iron possesses originally the fusibility of cast-iron, and eventually acquires some of the strength and toughness of wrought-iron. It may be used for heads, shoes and other joints in roofs, and for all articles in which intricacy of form has to be combined with a certain amount of toughness.

Wrought-iron.

"Wrought-iron has many most valuable qualities, though these differ considerably as to degree in different varieties of the material.

"Its tensile strength is three or four times as great as that of cast-iron, but it offers not half the resistance to compression.

"It is, however, very tough and ductile, and therefore gives way gradually instead of suddenly snapping.

"Its elastic limit is equal to about half its ultimate strength, and it will bear repeated loads below that limit without injury.

"Wrought-iron is practically infusible, is malleable hot and cold, is weldable at high temperatures, and can be forged into various shapes.

"It is subject to 'hot and cold shortness' produced by impurities, and to other defects. Large sections are more likely to contain flaws than small ones. Bars are, as a rule, stronger than plates, and plates are stronger with the grain than across it.

"Malleable iron rusts quickly in moist air, but stands salt water better than cast-iron.

"The great tensile strength of wrought-iron leads to its employment for tie-rods, bolts, straps, and all members of any structure which are exposed to tensile stress; it is also much used for members which undergo compression," particularly if very long compared to their diameters, or if exposed to fire. "It should be employed for all important iron beams and girders, especially those exposed to sudden shocks. In its various forms it comes into play in a variety of ways in roofs, braced girders, and iron structures of all kinds. Corrugated sheets are much used for roof coverings.

Hard and Soft Steel.

"Steel differs even more than wrought-iron in the characteristics of its several varieties.

"It has a high tensile strength, much greater than that of wrought-iron. Its resistance to compression is also much greater. Moreover, it has a harder surface, and is better able to resist wear and tear.

"Hard steels, containing a large proportion of carbon, are fusible, easily tempered, have a high tenacity and elastic limit. Their resistance to compression is enormous, especially when they are tempered, but they cannot be easily welded or forged, are brittle, and very uncertain in quality.

"Soft mild steels have a tenacity and resistance to compression, and an elastic limit somewhat" (proportionately much) "higher than wrought-iron. They can be hardened and tempered, but not easily. They are weldable and easily forged, and afford a very (?) reliable and ductile material adapted for structures subject to sudden shocks.

"Steel is more easily oxidized than wrought-iron, and far more easily than cast-iron.

"Steel is at present hardly used at all by the builder. Sometimes bolts," pins, "and cotters are made of steel for large roofs.

"It is not adopted for engineering structures to anything like the fullest extent of which it is capable, but is required by the engineer for tools, rails, boilers, machinery, wheels, etc., and is coming into use for some of the larger roofs and bridges."

Forging and Welding.

The process of welding different pieces of iron together is a very important one and as it occurs frequently should be well understood and carefully watched. All iron to be forged to any shape should be thoroughly heated to an almost white heat, but not too much for fear of burning it; the heating should be as uniform as possible and the iron should be worked as quickly as possible. The heat destroys the fibrous nature of the iron, and crystallizes it, but the fibres are again restored by hammering. Care must therefore be taken to thoroughly hammer all parts. All angles should be avoided in forgings. Welding is the same process as forging, except that two separate parts are joined together. The metal in each is heated and the two are thoroughly hammered together. It is very easy to weld two pieces of wrought-iron together, as the iron becomes sticky at a comparatively low temperature. Pieces of steel can be welded together if both are low in carbon. Those high in carbon cannot be welded. Iron and steel can be welded together if the steel does not contain too much carbon. Where the amount of carbon contained in the two pieces to be welded varies, the one with least carbon should be heated to a greater temperature than the other. With cast-iron no welding is possible. Welded joints in tension are considerably weaker than the original metal.

Welded Steel and Iron.

Sometimes layers of steel and iron are piled together, heated and rolled out into one mass, called three-ply steel and iron, five-ply, etc., according to the number of plates in the pile. These are used for safes and vault-work; after being rolled the steel is tempered or softened, the iron not being affected by the process. The plates are now fitted, drilled, etc., and then are hardened, when it becomes impossible to drill them on account of the extreme hardness of the steel layers, nor can they be broken by sledge hammers or hydraulic rams, on account of the elasticity of the iron layers, which are not affected by the hardening process.

Hardening and Tempering Steel.

In hardening steel the colder the water and the more suddenly the heated metal is plunged into it, the harder will be the quality. By using oil for the cooling plunge instead of water the steel is less likely to crack or warp during the process. To remove the brittleness from hardened steel it is tempered as already explained, by reheating it to a much lower temperature, however, than before, and again plunging it in a water bath to cool or allowing it to cool slowly. Hardening steel adds greatly to its tensile strength and increases the limit of elasticity, but on the other hand greatly reduces its ductility.

Softening or Annealing Steel.

To soften very hard steel it is annealed, that is, heated to a red heat and then allowed to cool very slowly in an annealing oven. The latter is a brick air-tight chamber in which several pieces of heated steel are placed to cool. The process of cooling is, of course, very slow, as the heat is retained by the brick walls and the radiations of heat from the different pieces greatly retard each other in cooling. In this way steel can be made to regain its original softness.

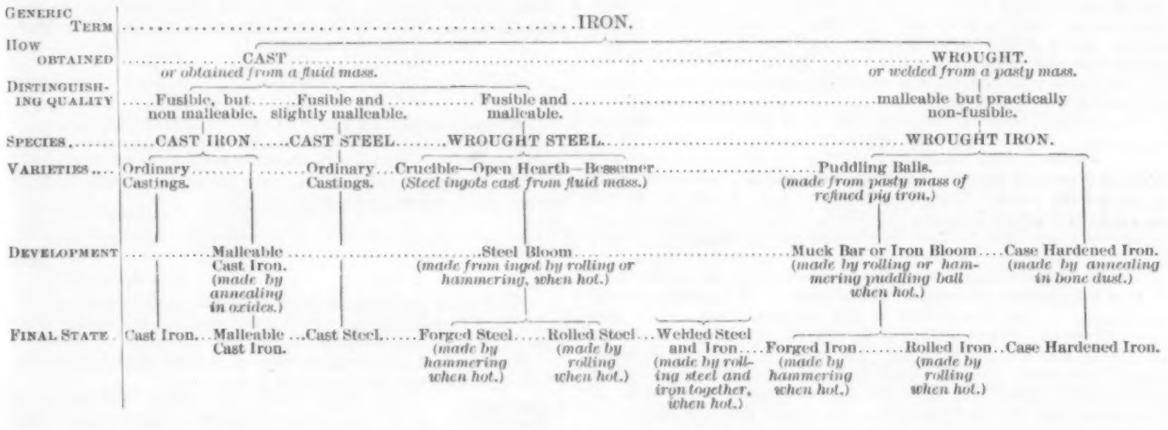
Case Hardening.

"Case hardening" is a process by which wrought-iron retains its tough and elastic nature but changes only its external skin to a depth of from $\frac{1}{16}''$ to $\frac{3}{8}''$ into hard steel so as to better resist wear and tear from external causes. This is accomplished by placing the iron in a box with bone dust and heating it to a red heat; it is kept thus for from half an hour to eight hours, according to the depth of skin desired and then quenched in cold water.

If the whole is to remain malleable it is not quenched in water but allowed to cool very slowly which leaves a skin of soft or mild steel.

TABLE XXIX.

Classification of Structural Irons and Steels.



This is worked as desired and on completion the whole is re-heated and quenched suddenly, which hardens the steel skin, but does not affect the iron interior.

Protection from Rust. The protection of iron after erection is a very important subject to the architect. If iron is exposed to the air, particularly alternating damp and dry air, or to wet mortar, it will surely rust unless protected. Rust means the gradual scaling, corrosion, and crumbling of the whole. Cast-iron is the least liable to rust; wrought-iron, however, is very liable to it, and steel even more so. In cast-iron the skin formed during the cooling of the metal by fusion with the mould sand and absorption of gases, is not only supposed to give great strength to the metal, but offers its best protection against the weather. When this is removed or damaged, the iron is not only supposed to be greatly weakened in strength but it is certainly very much more liable to rust.

Rust is like a disease, and must be entirely cleaned off the metal before covering it, or it will continue to eat its way in. Where sand-paper is not sufficient for its removal, a bath of diluted sulphuric, muriatic, nitric or other strong acid should be resorted to.

All parts which are planed and are to make exact joints, and cannot, therefore, be painted, should be kept carefully covered at all times until erection with a heavy coating of lard and white lead mixed.

Metallic Paints. All iron and steel pieces should be so designed that all parts are readily accessible for painting. For this purpose it is usual to use any of the so-called metallic paints, which are made mainly from earths rich in iron ore (red oxide of iron). A heavy coat of this should be put on immediately after finishing, first removing all loose scales. In practice, however, this is rarely done, as it is found cheaper by the iron contractor to do his own painting, rather than to pay the mill price. The architect should insist, however, that every speck of rust and all loose scales be cleaned off before any painting be done, and should not be talked out of it by the so-called practical man (who always has plenty of "pocket judgment").

In place of metallic paints, a mixture of red lead and linseed oil makes an excellent protector, but is rather more expensive than most metallic paints, as it does not cover so much surface as the latter. Some authorities claim that lead paints set up galvanic action with the iron, and so injure it. On the other hand, if the metallic paint is made from a protoxide of iron, instead of red oxide, it is said it will rust within itself.

Finishing Paints. There should never be less than two coats of metallic or red-lead paint on iron before attempting to finish same in colors, bronzing or gilding. It will take at least two additional coats of white lead and oil paint in colors to hide the color of the metallic paint. These two additional coats should also be put on under and before bronzing or gilding. Bronzing is done on interior work only, and is done by painting with a mixture of bronze powder and varnish. In gilding, the paint is covered with a coat of the usual oil gold-size, and then the hammered gold-leaf is put on.

Galvanizing Process. Iron is frequently galvanized, which gives it an effectual protecting skin so long as this remains intact, and is not cracked or broken by bending or blows. This skin consists of a thin coating of zinc. The iron is first cleaned by being soaked in a weak solution of sulphuric acid, is then sand-papered and washed. After this it is dipped, while hot, into a bath of chloride of zinc and then "plunged into molten zinc, the surface of which is protected by a layer of sal ammoniac."

Tarring Process. In many cases, particularly with cast-iron pipes, the iron is tarred. This is a very good protection for the iron, but is apt to cover up and hide defects, such as sand-holes, etc.; for this reason the use of tarred pipes is sometimes prohibited, notably by the New York City Board of Health. The iron is heated to 700° F., and dipped into a mixture of coal-tar, pitch and five per cent to six per cent of linseed oil, heated to 300° F. The iron is left in it till it acquires the temperature of the mixture, when it is removed. In practice, the iron is usually dipped into the mixture without the preparatory heating.

Japanning Process. Sometimes iron, notably registers and hardware, is japanned. This consists in painting the iron with a mixture of lead-paint, oil and copal varnish, with successive coats of copal varnish, all dried at a very high temperature.

Electro-plating Process. Sometimes iron is protected and beautified by electro-plating. This consists of depositing on the iron in an electric-bath successive, but very thin, layers of brass, copper, bronze, etc. These effects are very beautiful, but expensive.

Bower-Barff Process. The Bower-Barff process turns the outside skin of the iron into a magnetic oxide of iron, the color being of a very beautiful dark blue-black, and susceptible of a high polish. The iron is thoroughly cleaned and put into an air-tight chamber, and kept at a very high temperature. Superheated steam, or air heated to a very high temperature, sometimes as high as 1600° F., is then passed over the iron for from five to seven hours.

The effectiveness of this coating to resist rust depends upon the length of the exposure in the oven and the height of the temperature.

Iron Cement. A strong cement for filling poor joints between ironwork under compression is made of sal ammoniac, iron filings and sulphur. The more iron used in proportion to the other ingredients, the slower will the cement set.

It is frequently attempted to get extra-strong irons or steels by re-working them. In cast-iron, as a rule, re-melting, within reasonable limits, increases the strength of the iron. Box gives one case where the second melting added some forty per cent to the original tensile strength of the pig-iron; the third melting added some fifty per cent to this, or more than doubled the original strength; and the fourth melting added another twenty per cent to this, or the metal became about two and one-half times its original strength (tensile). On the other hand, Mr. Fairbairn found that the transverse, tensile and compressive strength of cast-iron was reduced gradually to the third or fourth melting, then increased with each melting till they reached their maximum at about the twelfth melting, and after that again decreased very rapidly. Accordingly, if the strength of the pig-iron were = 1,0 the third melting (second after pig) would give a minimum transverse strength of 0,82 and a minimum tensional strength of 0,77; while the maximum transverse strength 1,41 and the maximum tensile strength 1,32 would be reached at the twelfth melting.

Re-melting Cast-iron.

With compression, the minimum strength 0,92 would be reached at the fourth melting, and the maximum 2,18 at the fourteenth re-melting. According to Gauthier's analysis, re-melting turns gray irons to white, decreases the graphitic carbon and the silicon, and increases the combined carbon, thus rendering the iron weaker in resisting tensile or transverse strains, but stronger in resisting compression.

However, the whole subject is very uncertain, the increase or decrease of strength by re-meltings depending evidently on the particular mixture of iron used. A test in each case would be the only reliable criterion. It must be remembered, too, that re-meltings mean much additional expense.

If cast-iron be kept melted in the furnace for a long time — from one to three hours — it can be greatly increased in tensile strength, some experiments showing nearly doubled strength.

Cold-blast iron seems to be stronger than hot-blast (in tension), varying with the temperature of the test piece, the cold-blast iron being nearly twenty-five per cent stronger than iron made with a blast at 250° F.

Effect of Thickness. Mr. Thomas Box has collected all the data obtainable as to the effect of thickness on cast-iron, and from them is obtained the formula:

$$t_1 = \frac{t}{\sqrt[2,3]{b}} \qquad (100)$$

Where b = the least thickness of a casting, in inches.

Where t = the ultimate tensional stress, per square inch, of a similar casting, whose least thickness is one inch.

Where t_1 = the ultimate tensional stress, per square inch, of a casting, whose least thickness is b inches,

and

$$k_1 = \frac{k}{\sqrt[2,3]{k}} \qquad (101)$$

Where b = the least thickness of a casting, in inches.

Where k = the ultimate modulus of rupture, per square inch, of a casting whose least thickness is one inch.

Where k_1 = the ultimate modulus of rupture, per square inch, of a casting whose least thickness is b inches.

Proportionate Strength of Castings. Accordingly if the transverse or tensional strength of a casting one inch thick be = 1,0 we should have:

For ½ inch thick = 1,350
For 1 inch thick = 1,000
For 1¼ inch thick = 0,907
For 1½ inch thick = 0,838
For 1¾ inch thick = 0,783
For 2 inch thick = 0,739
For 2½ inch thick = 0,671
For 3 inch thick = 0,620
For 4 inch thick = 0,547
For 5 inch thick = 0,497
For 6 inch thick = 0,459
For 7 inch thick = 0,429
For 8 inch thick = 0,405
For 9 inch thick = 0,385
For 10 inch thick = 0,367

According to Hodgkinson the tensile strengths of cast-iron bars 1″, 2″ and 3″ thick would be as 1,0 is to 0,8 and to 0,77 or slightly more than the above.

Louis DeCoppet Berg.

[To be continued.]

Strange Death of an Artist. — A curious accident, which unhappily has since proved fatal, befell M. Boutet, an artist, residing in the Avenue Victor Hugo, recently. M. Boutet was working in his studio, when, inconvenienced by the sun, he asked his *bonne* to get on the roof and pass a light linen covering over the glass. As the woman was arranging this awning she slipped, and falling through the glass, alighted on the table at which her master was seated. Oddly enough, she sustained no injury worth mentioning. M. Boutet, however, was not so fortunate. A piece of the broken glass struck him on the neck, severing an artery. He tried to stanch the blood, and failing, ran out of the house in the direction of a neighboring druggist's shop; but he fell down fainting ere he reached the place, and two hours afterwards he breathed his last. — *London Times.*

Comparative Table Illustrating E. T. Potter's System[1] for Concentrated Residences.

[The subjoined statements recapitulate and so complete the discussions of the subject of the best use that can be made of urban territory for house building which have appeared in the pages of the *American Architect* at intervals during the last ten years.]

Differentiation of this System from Systems heretofore in use.[2]

CONCENTRATION: —

1. *In Rows.*

It allows of being Built in Rows; *i. e.*, with each Dwelling enclosed between two others.

This differentiates this System from: — All "detached" or "semi-detached" dwellings; such as most Farm-houses, Country-houses, Villas, and other rural and suburban dwellings in the United States, British Kingdom or Colonies, and parts of Continental Europe.

2. *In Stories.*

It allows of Placing Families one over the other in Stories.

This differentiates this System from: — All dwellings intended for but one family under one roof.

HEALTH: —

3. *Direct Light.*

It gives Direct Light in every Room.

This differentiates this System from: — All dwellings which contain any rooms lighted solely from other rooms, or from "shafts" or "wells" of light.

4. *Good Air.*

It gives the best Air at the Site.

This differentiates this System from: — All dwellings which have any rooms which get air solely from other rooms, or from close-bottom courts, shafts, wells, etc. Which air is therefore liable to be foul, because stagnant, or vitiated, or bearing smells or germs of disease, etc., from other dwellings opening into the same shaft or court.

5. *Thorough-Draught.*

It has a through and through draught of air at command through every Dwelling.

This differentiates this System from: — All dwellings whose windows all face in one direction; or which from any cause, lack command, at pleasure, of a through and through draught of air.

6. *Sunshine.*

It gives Sunshine in Every Dwelling.

This differentiates this System from: — All dwellings which, from their position or plan, are deprived of sunshine in winter, or throughout the year.

7. *No Overshadowing.*

It provides against Overshadowing from similar Buildings.[3]

This differentiates this System from: — All systems of planning of groups of buildings in which the prevention of harmful overshadow from similar buildings is not considered and provided against.

8. *Conformable to the Health Laws of New York.*

It Conforms to the Health Laws of New York.

This differentiates this System from: — All plans which, however otherwise excellent, cannot be made to conform to the letter, as well as the spirit, of the Health Ordinances of New York.

COMFORT: —

9. *Privacy.*

It furthers the Privacy of each Dwelling: by providing it with a private Dumb-waiter and, in connection with it, two private Cellars (one for food, and one for fuel), and a private clothes drying and bleaching space; by the absence of corridors; and by the prevention of overlooking from the windows of adjoining dwellings.

This differentiates this System from: — All dwellings which lack these, or compensating, aids to privacy; and differentiates it in proportion to such lack.

10. *Laundry Facilities.*

It gives private Laundry facilities to each Dwelling.

This differentiates this System from: — All dwellings which lack private facilities for washing, drying and bleaching.

11. *Quiet.*

It furthers quiet by the absence of Corridors or open stair-wells; and by the enclosing of entrance ways.

This differentiates this System from: — All buildings which have longitudinal or other extended public corridors or passages on each floor, or have open stair-wells; and from buildings, the dwellings in which are approached through open courts, *cités*, alleys or slums.

12. *Allows of Elevators.*

It allows of Elevators communicating on each story, like the stairs, with two (or sometimes three) dwellings; [also of using one general Elevator for mounting to an upper floor, and thence descending, by the stairs, to any dwelling].

This differentiates this System from: — All buildings where the use of an elevator necessiates having public corridors on each floor, whereby quiet and privacy are lessened, and having dwellings with rooms facing in opposite ways, so as to command thorough-draught, is prevented.

13. *Sea-Breeze.* (In New York.)

It allows, in New York, the Sea-breeze to enter every Room.

This differentiates this System from: — All rooms in New York, whether in tenements, flats, apartments, or private houses, which do not have, or do not open into rooms which have, windows facing south, or southeast, or southwest.

RECREATION: —

14. *Play-Ground.*

It provides a Play-ground in the open air with every house, for the use, in common, of the Children of all the families residing in it.

This differentiates this System from: — All tenements, flats, apartments, or houses, which provide no playing-place for the children of their occupants except the dwellings themselves, or the public halls and corridors, and stairs of approach to them, or else the public streets, or nearest public square, or open spaces.

15. *Garden-Bed.*

It gives a private Garden-Bed to every family.

This differentiates this System from: — All dwellings which lack this feature.

APPEARANCE: —

16. *First-class Approach.*

It gives a first-class Approach to every Dwelling.

This differentiates this System from: — All dwellings the approach to which indicates by size or position, inferiority of means or social position in their occupants.

PRACTICABILITY: —

17. *Separate Ownership.*

It allows of Separate Ownership of each Dwelling; and of securing of the same by small weekly payments.

This differentiates this System from: — All dwellings and plans for dwellings in which the character of the plan, or the approaches to the different rooms and suites of rooms or other circumstances prevent or do not lend themselves to, separate ownership of the separate dwellings.

18. *Suits New York Lots.*

It can be used on New York Lots.

This differentiates this System from: — All dwellings, or plans for dwellings which, like the Peabody Houses in London, cannot be repeated on New York lots without waste of land, or else a radical change in the character of the plan.

19. *Available Everywhere.*

It can, in some of its forms, be made Available Everywhere.

This differentiates this System from: — All plans suited only to corner lots, or to lots of certain dimensions: — or to local, or national, customs or requirements.

USEFULNESS: —

20. *Meets Pressing Needs.*

It meets pressing needs for Comfortable Housing for all Classes in New York, or wherever population is dense.

This differentiates this System from: — All plans for housing only certain classes (*e. g.* the "working class"); or plans which (as in the laying out of the streets in Philadelphia) practically tend to separate as to streets and neighborhood, those of different means, and so lack (however otherwise admirable) availability for future general use.

21. *Provides a Way of Avoiding New York Tenement House Evils.*

It provides a way of avoiding the Tenement-house and Apartment-house evils hitherto prevailing in New York, which are bred there and elsewhere, by the exclusive employment of an inflexible system of deep close-back lots.[4]

This differentiates this System from: — All plans of, or for, Improved Tenement-houses or Apartment-houses, in New York or elsewhere, which lack the features of this System named above as factors, Nos. 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, and 16.

[1] System: Any complexure or combination of many things acting together. A scheme which reduces many things to regular dependence and cooperation. — *Johnson's Dictionary.*

[2] In an intermittent, but almost constant, study, in several countries, of this subject, since circumstances, over thirty years since, called his attention to the mortality, suffering, and discomfort consequent on the lack of thorough-draught, or even proper air or light in the bed-rooms of New York tenement-houses, the author has found no buildings, or plans for buildings, uniting the factors which he has here tabulated and combined in a System.

[3] (See section on diagram illustrating this System in the *American Architect and Building News*, October 15th, 1887.)

[4] [See Circular by the author: to whom it may concern, December 20th, 1876.]

THE FAYUM EXPLORATIONS.

SOME five or six miles distant from Illahûn, on the other side of the Bahr Yusûf, Mr. Petrie discovered the remains of another town, less remotely ancient, but of a highly interesting period, everything found in the ruins being of the latter end of the Eighteenth Dynasty or the early part of the Nineteenth Dynasty. Like the little town at Illahûn, it is all of one period, the houses never having been rebuilt, but standing on the desert sand as first erected, with the upper parts of the walls falling in, and the ruins choked with dust, sand and rubbish. Here, too, the town is surrounded by a wall, and just outside the wall, lies the necropolis. The modern name of this place is Tell Gurob, the ancient name being as yet unknown. The cartouches of Thothmes III, on a sculptured block, a porcelain ring stamped with the titles of Tutankhamen, and another with the titles of Horemheb, give the earliest royal names discovered, and mark the beginnings of the place under the Pharaohs of the great Eighteenth Dynasty. It continued to flourish through the reigns of Rameses I, and Seti I, and began probably to decay in the time of Menepthah, the supposed Pharaoh of the Exodus. In the reign of Seti II, who was a son of Menepthah, and grandson of Rameses II, it was already deserted and in ruins. The cemetery, however, like the cemetery of the Twelfth Dynasty settlement at Illahûn, continued to be in use long after the town had ceased to be inhabited, Mr. Petrie having there exhumed mummies of many different ages, from the Rameside to the Ptolemaic periods. These last are mostly decorated with head-cases and breastplates of what is technically called "cartonnage," like the mummies from the Hawarak cemetery exhibited by Mr. Petrie last year at the Egyptian Hall in Piccadilly. This "cartonnage" which, as an ancient Egyptian manufacture, dates from the Eighteenth Dynasty, is, as a rule, composed of from twenty to forty thicknesses of coarse linen glued and pressed together, and coated with a thin layer of stucco. Not so, however, the cartonnage head-cases of these Ptolemaic mummies at Tell Gurob, which have yielded one of the most unexpected of Mr. Petrie's recent results. We give the story in his own words from a journal-letter dated the 16th of March: "A most curious find is a new source of papyri. The cartonnage head-cases so common here, are built up of papyri, with a thin wash of plaster over all. The layers of papyrus can be easily separated by soaking and are none the worse. I get in this way a quantity of Ptolemaic documents in pieces as large as one's hand, some being fragments of royal decrees beginning, 'King Ptolemy to ——, greeting,' etc. One head contained an ephemeris, or daily record of court affairs and regulations of the fourteenth year of Ptolemy Philadelphus. There are also some curious letters; among others, part of an epistle from a youth at college, telling his father how he is getting on, and saying that he now understands mensuration and can draw a plan of a house. Another letter is from one of the royal gooseherds, stating that he cannot supply twelve geese for King Ptolemy's festival."

There does not at present seem to be any clue as to where these people lived who were buried at Tell Gurob in Ptolemaic times; but the mere fact that waste papyrus was so abundant as to be sold to the undertakers for funerary cartonnages shows it to have been an important centre, and probably a royal residence. Be this as it may the moral pointed by Mr. Petrie's discovery will not be thrown away upon the keepers of Egyptian departments in European museums.

Some of the finest bronzes in the way of domestic objects ever found in Egypt have been discovered this year by Mr. Petrie in the town rubbish at Tell Gurob. These consist of knives, chisels, axe-heads, mirrors and the like; the gems of the series being two beautiful shallow pans measuring respectively nine inches and fifteen inches in diameter, by two inches in depth. These are described by Mr. Petrie as "triumphs of hammer work," and so thin as to be quite elastic and bendable, although they have thick rims. Both are inscribed on the side in hieroglyphic characters, the smaller pan to the "Ka" of one Kheraa, and the larger to the "Ka" of one Seti, a royal scribe attached to the palace of "the great lake." These dedications show them to have been votive offerings, and of a funerary character. An abundance of ordinary domestic objects, such as wooden combs, netting-needles, pottery, balls of thread, and scraps of jewelry of Eighteenth and Nineteenth Dynasty type have also been found in the town.

But all the rest of Mr. Petrie's discoveries of the present season, including even his harvest of Twelfth Dynasty papyri, fade in comparison with the interest of a series of most extraordinary alphabetic signs incised upon the pottery of the Twelfth Dynasty at the little settlement of Illahûn, and upon pottery of the Eighteenth and Nineteenth Dynasty at Tell Gurob. The pottery of the Illahûn settlement, as already stated, is *sui generis*, and decorated with patterns imitating basket-work. The Tell Gurob pottery is partly of the Cypriote and partly of the Mycenæan types. The styles of the two towns are as distinct as the periods to which they belong. The characters incised upon them have, however, this much in common — that they are neither hieroglyphic nor hieratic. In a word, they are not Egyptian, but apparently very early Cypriote or Greek. Moreover, the signs traced on the Twelfth Dynasty pottery are distinctly Cypriote, while Phœnician also is found upon the later pottery of Tell Gurob. This revelation will not appear so incredible to Egyptologists as to Greek scholars, the presence of Ægean Greeks in Egypt being recorded as early as the time of a king of the Twelfth Dynasty. But that these prehistoric islanders should have settled in the little town of Fayûm in the time of the Usertesens and Amenemhats, bringing with them, at that remote date, the rudiments of the Cypriote and perhaps also of the Phœnician alphabets, may well surprise not only classical but Oriental scholars. At Tell Gurob, the evidences of a foreign settlement are overwhelming. All the weights found in the ruins of the town are of the Assyrian standards; and in the cemetery have been found interments of an alien race with yellow hair and foreign names. On one mummy-case we find the name of a man called An-Tursha, the Tursha as a nation, having long been well known to us through Egyptian inscriptions as allies of the Achæans and Lybians against Egypt. Another figure is inscribed for one Sati-amiu — a name which has a decidedly Semitic flavor. That Mr. Petrie's conclusions should be accepted without the fullest examination of the evidence, and before the objects in question have been viewed and discussed by scholars of all specialties, is not to be expected. But the pottery with its strange inscriptions, the mummy-cases of the alien colonists who were buried at Tell Gurob, the weights of Asiatic standards, and even the yellow locks of Tursha and his kin are on their way to this country — have perhaps already been landed — and will soon be exhibited to the public.

Of a wonderful tomb also opened by Mr. Petrie at Hawara, and of the finding of a mummy literally covered from head to foot with jewels and gold, we have now no space to tell. But to have unearthed any amount of "barbaric pearl and gold" is as nothing compared with a discovery which shows that the beginnings of the alphabet were already in existence some 2,000 years before the Christian era, and which proves that the Iliad might, after all, have been committed to writing in the lifetime of Homer.

It should be added that the result of Mr. Petrie's excavations are duly submitted at the close of each season to the authorities of the Boulak Museum, and are subject to such claims as may be made by the director on behalf of the National Egyptian Museum. All the finest bronzes, statuettes, jewels, amulets, etc., as well as the alabaster table of offerings from the pyramid of Amenemhat III, and the most valuable of the mummy-cases, have this year been detained at Boulak.— *London Times, July* 20.

SOCIETIES

BOSTON ARCHITECTURAL CLUB.

THE Boston Architectural Club made an excursion to Newport Saturday, August 3, going down by the early morning train, and reaching Newport at 11.30. The residence of Mr. Cornelius Vanderbilt was first visited. Mr. Vanderbilt received the members personally, accompanying them over the house and grounds. A visit to Mr. Van Alen's house was next made, accompanied by the architect, Mr. Dudley Newton, and later in the day the party went to Mrs. Turnbull's house, under the direction of Mr. Newton. After lunch the party visited the Channing Memorial Church, the Casino and a number of private residences, and then made the entire tour of the cliff walk, ending with an inspection of the new bath-house at the bathing-beach. The return was on the New York Limited *via* Wickford Junction, the dinner being served on the cars. The occasion was a very enjoyable one, and the twenty-eight members that formed the party passed a hearty vote of thanks in appreciation of the courtesies extended by Mr. Vanderbilt and Mr. Newton. The party arrived in Boston at 11 P. M.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

INCREASING THE MEMBERSHIP OF THE PRESENT ARCHITECTURAL SOCIETIES.

New York, N. Y., August 5, 1889.

To the Editors of the American Architect:—

Dear Sirs,— Mr. Normand S. Patton, Secretary of the Western Association of Architects, in your issue of the 3d inst., puts the case lucidly and altogether well, from one point-of-view (taken, I dare say, by as many practitioners as another view by the rest), as to the admittance of candidates to that organization or to the American Institute of Architects before the consolidation of the two bodies is perfected in detail at their approaching joint convention. Personally, I think his view of the case just about as tenable as that which

sees in the pending status a temptation for either society to "be more lax in its scrutiny of applicants than formerly," or than will be the case after their unification shall be completed.

What the profession needs to become, a united, powerful and persistent force, which must be respected *per se* and reckoned with — what it absolutely requires to be put *en evidence* before the community and before the federal, State, county and municipal legislatures, which it rightfully seeks to influence in the public's interest — is, as Mr. Patton so clearly points out, a representative society, the "large membership" of which, with "a correspondingly large income, will enable it to do many things that a smaller organization could not accomplish," and which no single one of them ever has accomplished, and which, moreover, never can be accomplished till the whole reputable portion of the profession is united, under the same general laws, as one man, for ever-needed defence and often-needed (while sometimes feasible) attack against the common enemy — Philistinism.

I hope, therefore, that Mr. Patton's letter will be well read by our architects, and that it will exercise all the influence it deserves. He will, however, I hope, permit me to note that one of his statements is apt to give a wrong impression. When he says that the aim of the Institute (after the consolidation is finished), "according to Article 2 of the new Constitution, shall be 'To unite in fellowship the architects of this continent, and to combine their efforts so as to promote the artistic, scientific and practical efficiency of the profession,'" the hasty reader (and most readers, in these days of crowded competition and steam and telegraph, are hasty) will undoubtedly suppose that such a rule of action has been absent from the regimen of the existing Institute, whereas the provisions he quotes are but the repetition, word for word, of the precise article on which the Institute has based all its action during the last thirty years. Moreover, this original declaration of the Institute has been adopted *verbatim* (and most wisely so, for, in my opinion, it is incapable of improvement) by every one — so far as I have observed — of the numerous architectural organizations which have sprung up, in every corner of the union, during the last few years — organizations which, while proving the wealth of material throughout the country available for a powerful national fraternity, constitute, at the same time, legitimate outlets for that local pride which is as necessary as it is becoming in the citizen of any State and the resident of any district, and are also the best and often the only convenient vehicles for sympathetic *camaraderie*, for mutual improvement and for defence against Philistinism, though, of course, they are quite inadequate to deal with the last beyond their own circle, and even within that are comparatively defenceless, as they must continue to be till they can cover themselves with the ægis of a body equal to national organization and coördination, and yielding them — for citation to clients and fellow-practitioners — the support of uniform regulations, confirmed by governmental and legal authorities, and, consequently, recognized and accepted by the public.

Yours truly, A. J. BLOOR.

THE CHARGE FOR PRELIMINARY SKETCHES.

CHICAGO, ILL., July 29, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — Can you give me some recent decisions relative to collecting fee for preliminary sketching, and oblige

Yours truly, W. D. C.

[WE do not know just what our correspondent means to ask. If he wishes to know whether the one-per-cent rule is accepted in the courts, we must answer that it seems to be of much less authority than the custom of five per cent for full services, if, indeed, it has ever been directly admitted, which we doubt, and a referee would be likely to use his own judgment in assessing the value of the work done. As to whether anything can be collected, the nature of the contract between the architect and his employer must decide, as shown by the evidence. — EDS. AMERICAN ARCHITECT.]

THE STRENGTH OF A CHURCH FLOOR.

MARSHFIELD, WIS., July 28, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — The floor of a church, building in this vicinity, has been constructed as follows: Wood beam, 10″ x 12″; floor-joist, 2″ x 12″, 16 inches from centres; double floor and ceiled on under-side of joist; size of floor supported on each column, 16 x 18 feet. This floor is supported on column of gas-pipe 6 inches in diameter, ¼ inch metal, 9 feet long, with cast-iron cap at top and bottom. Question: Is the column sufficient to support the floor? You will very much oblige an old subscriber of your magazine by replying in your columns. Respectfully yours,

CHAS. WILLSON.

[If the gas-pipe columns have spreading bases and caps, well screwed on and at right angles with the columns, and if the bases are well bedded and the caps screwed or bolted to the girders, they are much stronger than the floor. If they are carelessly made, or badly put together, they may be weaker than the floor, but the girders would be likely to fall before the columns. — EDS. AMERICAN ARCHITECT.]

NOTES & CLIPPINGS

ANGLE OF REST FOR DRY SAND. — A Mr. Bolton in recent visits to Egypt and Mount Sinai measured the maximum angle at which dry sand will lie at rest, and found it to be from thirty-one to thirty-two degrees; higher than this it will move down the slope. This does not accord with the well-known formula in text-books. — *N. Y. Herald.*

A LARGE MILL CHIMNEY. — The tall chimneys erected by the Hargraves and Globe Yarn Mills now bid fair to be eclipsed by one being erected at the Fall River Iron Works Company's mill. The experts on the heights of chimneys say that it will be the second highest in this country. Instead of hoisting the brick and mortar on the outside, as is commonly done, an elevator is being built to run up the interior of the chimney. It is to be run by a hoisting engine by means of a wire cable. As the work progresses the guides for the elevator will be erected inside, and the overhead work moved upward. There will be 1,500,000 bricks used, and the total cost will not be far from $10,000. The work on the foundation is completed. It contains 2,000 tons of Fall River granite, held together with 700 barrels of Portland cement. The bottom stone is eight feet below tide water, and the top one is eight feet above. The total height of the chimney above the level of the ground will be 340 feet. The pressure on the foundation stones will be two and a half tons per square foot. At the base the stack will be square, but about 20 feet from the ground the corners will be sloped away and the whole affair will rise in circular form into the air and in general outline will seem like a gigantic baseball bat. Away up in the air the chimney will be crowned by a terra-cotta cap, each section of which will be five feet thick. Other dimensions are: Diameter at base, 30 feet; diameter at head, 25 feet; diameter at smallest part, 15 feet 4 inches. The flue will be 11 feet in diameter. — *Fall River, Mass., Globe.*

PREHISTORIC REMAINS FOUND IN THE STATE OF CHIAPAS. — Recently returned explorers from the State of Chiapas confirm and add to the remarkable reports concerning important archæological discoveries. A fine broad paved road, built by prehistoric inhabitants, has been traced from Tonala down into Guatemala and thence in a curve up again into Mexico, terminating at Palenque. All along this road are still to be seen the remains of ruined cities, and the careful estimate of the population of these places is about thirty millions. On that part of the road near Palenque the ruins are of great magnitude. Houses four and often five stories high have been found in the depth of the forest. Many of these houses are pyramidal in form and so covered are some of them with vegetable mould that large trees are growing from the roofs. In some of the houses great employment has been made of stone beams of tremendous weight, and the architecture indicates a high degree of scientific attainments. In some houses visited bronze lamps have been discovered, and the interior and exterior mural decorations of the more important houses consist of panellings filled with elaborately-carved figures almost life-size, two types of men and women being represented, some plainly Egyptian and others genuine Africans. In front of one of the houses the explorers found fourteen sculptures of gods with folded arms. The work of exploration was one of extreme difficulty, owing to the density of the forest and the unwillingness of the Indians to enter the ancient edifices, they averring that the buildings were inhabited by spirits. Another discovery was that an enormous paved road extends from Palenque across Yucatan to the island of Cozumei and is continued on the island. The explorers went to Chiapas on private business, but incidentally became interested in the work of exploring the ruins, and they suggest that the Government fit out an expedition to make a complete map of this wonderfully interesting region, regarding which little comparatively is known, even after so many years since the white men became aware of its existence. Palenque explorers assert that they have discovered in the edifices before mentioned examples of a perfect arch. One explorer is a scientifically-trained man who has recently arrived from India, and by his account the region from Chiapas to Yucatan must have been the seat of a densely populous nation. — *New York Times.*

THE CORROSION OF IRON IN STRUCTURES. — Attention has frequently been directed to the large amount of corrosion which wrought-iron undergoes when unprotected from the influences of an acid atmosphere and rain-water. Mr. Charles Cochrane referred to the subject in the course of his inaugural address as President of the Institution of Mechanical Engineers, and instanced the wasting exhibited in bridges constructed on the Thames. In these instances he considered the deterioration was aggravated by the acid condition of the atmosphere, due to the presence of sulphurous acid from the combustion of coal as well as to the customary percentage of carbonic acid. In the course of 25 years bolts have been eaten away from an original diameter of 5–8 of an inch to one of 5–16 of an inch, being a reduction in area of 75 per cent, or from 0.31 to 0.08 square inch, and this in a portion of the structure where the brackets of an overhanging footpath were supported in part by the decaying bolts. Wherever the rain trickled over the face of the girders to which the brackets were attached, the same evidence of deterioration was manifested in the scaling of the plates; pointing both to the necessity of preventing water from coming in contact with wrought-iron, and of periodically examining and painting structures of this material. Another illustration of insidious destruction of iron was named. This was the case of a wire rope at a colliery, kept in reserve to wind men up and down the shaft in case of ropes breaking or of other accident preventing the due use of the winding shaft. While at rest the emergency rope was subject to the drip of rain at the same spot for some years, from the roof of the engine house. External examination was strict, and the rope was regularly greased, as is customary. At length a man riding up the shaft was

killed through the parting of the rope at the point exposed to the rain drip, and the wires internally, were found to have been corroded to the size of drawn-out needle-points. From these and other considerations, it is evident that too much care cannot be bestowed upon the protection of wrought-iron in exposed positions, more especially as there is a growing tendency to diminish the allowance made for corrosive action in designing wrought-iron structures. — *Mechanical World.*

Jasper. — Within two years the jasper industry has been developed and there are now four quarries, employing nearly 1,000 men, in operation about Sioux Falls. The market extends from Chicago to Kansas City. Sioux Falls streets are paved with jasper, and her four-story buildings are constructed of it. The stone is susceptible of a high degree of polish, and when finished looks much like the red granite of Missouri. The pioneers in the jasper industry discovered not long ago that the dust of the jasper, which is half as hard as diamonds, would polish the famous petrified wood of Arizona, and make of it table-tops and ornaments more beautiful than agate or onyx. The petrified wood is now brought from Arizona to Sioux Falls by the carload, and cut and polished in a variety of forms. To her jasper industry the city has added the manufacture of chalcedony. If these enterprising people do not find all of the precious things mentioned in the Book of Revelations it will not be for the want of searching. There is a scientific mystery about this so-called jasper. Practically it is all right. Its utility has been established, but geologically there is no little uncertainty about it. Those who know the most are the least positive, in discussing its character. Some of the scientific men who have looked at it call it a red quartzite. Professor Winchell says it is the hardest stone in the United States that has been used for building purposes. The grain is very close. The only element to which it succumbs is fire. It will stand a good degree, but crumbles like limestone and sandstone under too intense heat. In the last day, when all the elements melt with fervent heat, the Sioux Falls jasper will have to go. — *Globe-Democrat.*

Is the Earth in Danger from the Drill? — Prof. Joseph F. Jones answers, in a recent issue of the *Popular Science Monthly*, the question, "Is it safe to drill the earth too much?" The professor assumes the earth to be a hollow sphere filled with a gaseous substance, called by us natural gas, and he thinks that tapping these reservoirs will cause disastrous explosions, resulting from the lighted gas coming in contact with that which is escaping. He compares the earth to a balloon floated and kept distended by the gas in the interior, which, if exhausted, will cause the crust to collapse, affect the motion of the earth in its orbit, cause it to lose its place among the heavenly bodies and fall in pieces. Another writer thinks that drilling should be prohibited by stringent laws. He, too, thinks there is a possibility of an explosion, though from another cause. Should such a disaster occur, "the country along the gas-belt from Toledo through Ohio, Indiana, and Kentucky will be ripped up to the depth of 1,200 feet or 1,500 feet and flopped over like a pancake, leaving a chasm through which the waters of Lake Erie will come down, filling the Ohio and Mississippi valleys, and blotting them out forever." Still another theorist has investigated the gas-wells with telephones and delicate thermometers, and he announces startling discoveries. He distinguished sounds like the boiling of rocks, and estimated that a mile and one-half or so beneath the Ohio and Indiana gas-field the temperature of the earth is 3,500°. The scientist says an immense cavity exists, and that here the gas is stored, that a mile below the bottom of the cavity is a mass of roaring, seething flame, which is gradually eating into the rock floor of the cavern and thinning it. Eventually the flames will reach the gas, and a terrific explosion will ensue. — *Scientific American.*

The Adit at Schemnitz. — An engineering work that has taken over a century to construct is one of the most notable landmarks in history, if, indeed, it be not without precedent. An instance of this kind is to be found in a tunnel not long since completed, but which was commenced more than one hundred years ago. This tunnel, or adit, is at Schemnitz, in Hungary, its construction being agreed upon in 1782, with the object of carrying off the water from the Schemnitz mines to the lowest part of the Gran valley. The work, which is now complete, forms the longest tunnel in the world, being some ten and one-fourth miles long, or about one mile longer than St. Gothard, and two and one-half miles longer than Mount Cenis. The height is nine feet, ten inches, and the breadth five feet, three inches. This tunnel, which has taken so long a period to bring to completion, has involved an expenditure of about five million dollars, but the saving to those interested, in being able to dispense with water-raising appliances, amounts to a large sum annually. A fact of no little interest in carrying out this project is that, though the latter generation had greatly the advantage in the matter of machinery for accomplishing such a work, the cost of labor was greatly in the former's favor. The original contract was for the completion of the tunnel in thirty years, at a cost of $35 per yard run, and for eleven years the construction was carried on at that price. Public events, however, interfered with the progress of the work, as well as enhanced the cost of labor and materials, the cost per yard eventually exceeding one hundred dollars. — *Providence Journal.*

Work on the Forth Bridge. — The completion of the Queensferry cantilever of the Forth Bridge was accomplished last week and was made the occasion of a visit from the Directors of the Forth Bridge Railway, accompanied by the Duchess of Roxburghe, Lady Tweeddale, Lady Wemyss, Lord Colville, Lord Hindlip, and others. Both sides are complete, and now only the bridging over of the large gap between the two sections remains to be done. The gap is still 350 feet in width, and in the course of the next three months a large hog-backed girder of that length and fifty feet in depth will connect them. The girder, which is the largest ever used in this country, will weigh 800 tons. Now that it is approaching completion, the bridge, as regards working operations, is becoming inconveniently popular, for hundreds of excursionists come from all parts of the country to inspect it. Three of the most distinguished German engineering professors, under Professor Müller of the Berlin Engineering School of the Berlin University, with fifty students, were conducted over the works by Sir John Fowler recently, the visit having been officially arranged by the German Ambassador. — *London World.*

Building from the Roof Down. — A visitor to Japan tells of the peculiar methods of construction employed in that country: "Speaking of house-building, the Japanese begin their work at the top. The roof goes on first, and then they begin to build the walls and to construct the interior. One of the greatest curiosities to me in Tokio is a new hotel which is being built. It is to be on the foreign style and is to have four stories. It will be the greatest hotel in Japan. It covers about an acre of ground. As yet not a stone of the foundation has been laid, but the roof is already up and this stands on a great four-story skeleton of scaffolding awaiting the building of the rest of the structure. This scaffolding is made of long poles from the size and thickness of a campaign flag-staff down to the size of a bamboo fishing-rod, and the whole is tied together with ropes. Imagine an acre of scaffolding of this nature upholding a heavy roof, and the whole made up of sticks and ordinary rope. There are, I was told at the office, 7,000 poles in the skeleton, and 2,000 men had been at work for months in making it." — *New York Mechanical News.*

TRADE SURVEYS

The general markets of the country have been bare of any significant features for the past six days. Trade, financial and commercial journals contain nothing but the usual stock-in-trade, and even the authorities in the commercial world, whose utterances are regarded with confidence, are either reticent or are repeating in a new shape old opinions. While there is nothing that is new to say, there are several features of the market that have not yet been properly observed and interpreted. The few failures that have taken place have had a much wider influence than is apparent upon the surface. Whether the influence is right or not, it has been exerted in the direction of a general drawing-in of loans and a closer settlement of accounts, etc. The failures referred to acted as a danger-signal, which thousands of men in businesses, big and little, have taken note of. In this respect the failures have been of advantage. They have brought about a closer inspection of actual conditions on the surface and below it. They have made men careful who had not been so, and have made money-lenders cautious who have heretofore felt no need for caution. The possibility of a general weakening in confidence has alarmed a great many, and the care that has already been taken to avert such a catastrophe has been productive of good results. Referring again to the subject of extraordinary building activity, it is to be noted that a large amount of work has been done on borrowed capital — much larger than has been supposed. Large blocks of money have been expended and loaned by trust concerns because of the supervision and control which could easily be exercised by the investors. Some prominent real estate authorities and conveyancers of wide experience have within a week or two past been furnishing some inside statistics and estimates, which, if studied by the building interests, might lead to a little more conservatism. The misfortunes to enterprise of this kind, should they come, will not fall upon the lenders of money, but upon the instalment-plan buyers of small houses and upon contractors and builders who have not yet been fully paid for their services. The same rush is kept up in all of the larger cities; in fact, since July 1, the activity in building has been greater than during the earlier months. With all, lumber, instead of advancing, has declined a little, excepting in Pennsylvania hemlock. The rush of Southern forest products into Northern markets has been partly responsible for this unexpected weakness. The iron trade has not weakened in the least, and in Western markets there are many evidences of growing strength. All of the observations heretofore made concerning the iron trade hold good with increased force. It will probably be strengthened by large contracts placed by railway interests. Commercial *résumés* concerning textile interests would have us believe that business is in a flabby condition, but an honest review of those interests justifies a condemnation of such opinions. The simple fact is that more textile products are being turned out and distributed in this country than ever, excepting at isolated periods. The general demand is increasing; the strong condition of the wool markets is evidence of it; the strength of the cotton market is another proof. The boot and shoe output, adding the product of some widely scattered factories to the New England production, is in excess of last year. New schemes are rapidly coming to the front. Thus far, there has been no difficulty in obtaining capital, and chiefly because the West and South are being supplied with little financial centres of their own. The extension of national banks to these sections has done much to liberate the far West and South from dependence upon the East. The effect of railway expansion is also felt, and the development of new industries and new mines has added sources of strength whose effects are far-reaching. No matter in what field an observation is taken, there are elements of strength discovered which are likely to survive any temporary depression, should one occur. New York commission and jobbing houses feel that they have been fully justified in making more ample preparation for the distribution of fall and winter goods than last year. There is a very strong undertone in that commercial centre. The factories and mills have not yet felt the full effect of it. Reports from Philadelphia show a strong feeling in manufacturing and commercial circles. Recent railroad reports indicate a further improvement in earnings. In the Ohio Valley, all of the industries seem to be in a very prosperous condition. The vitalizing influences that have been at work for a year or two in the Northern Mississippi Valley region are exerting themselves in all of the territory contributory to Chicago. Throughout Kentucky and Tennessee there is great activity at all the little industrial centres, and the railway managers deserve credit for the painstaking efforts they are making to assist in the further development of the resources of the South. New Orleans is gaining ground every month as a commercial and a manufacturing centre. The possibility of obtaining a cheap supply of Alabama coal is drawing the attention of a good many capitalists to that city.

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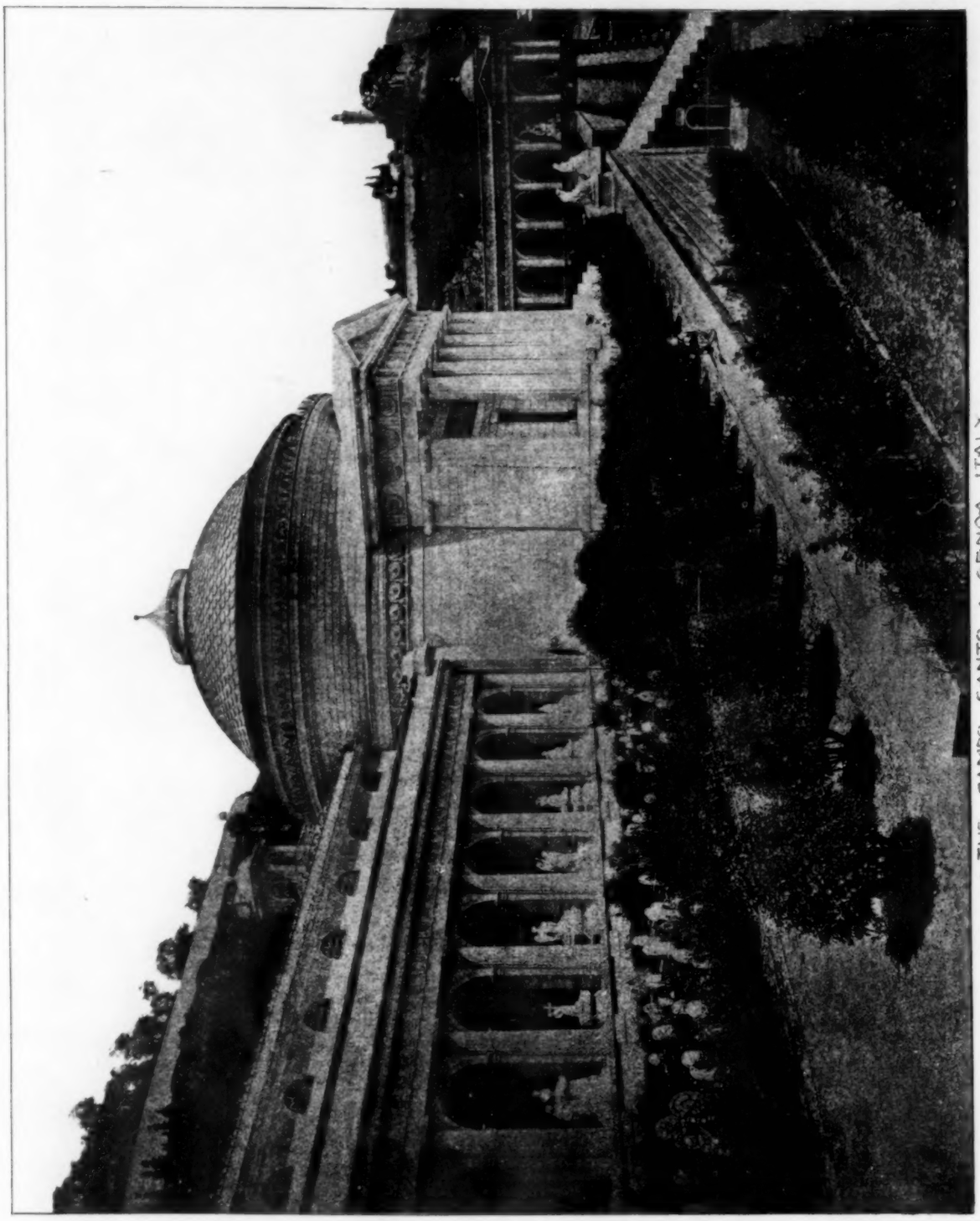

THE CAMPO SANTO · GENOA, ITALY.

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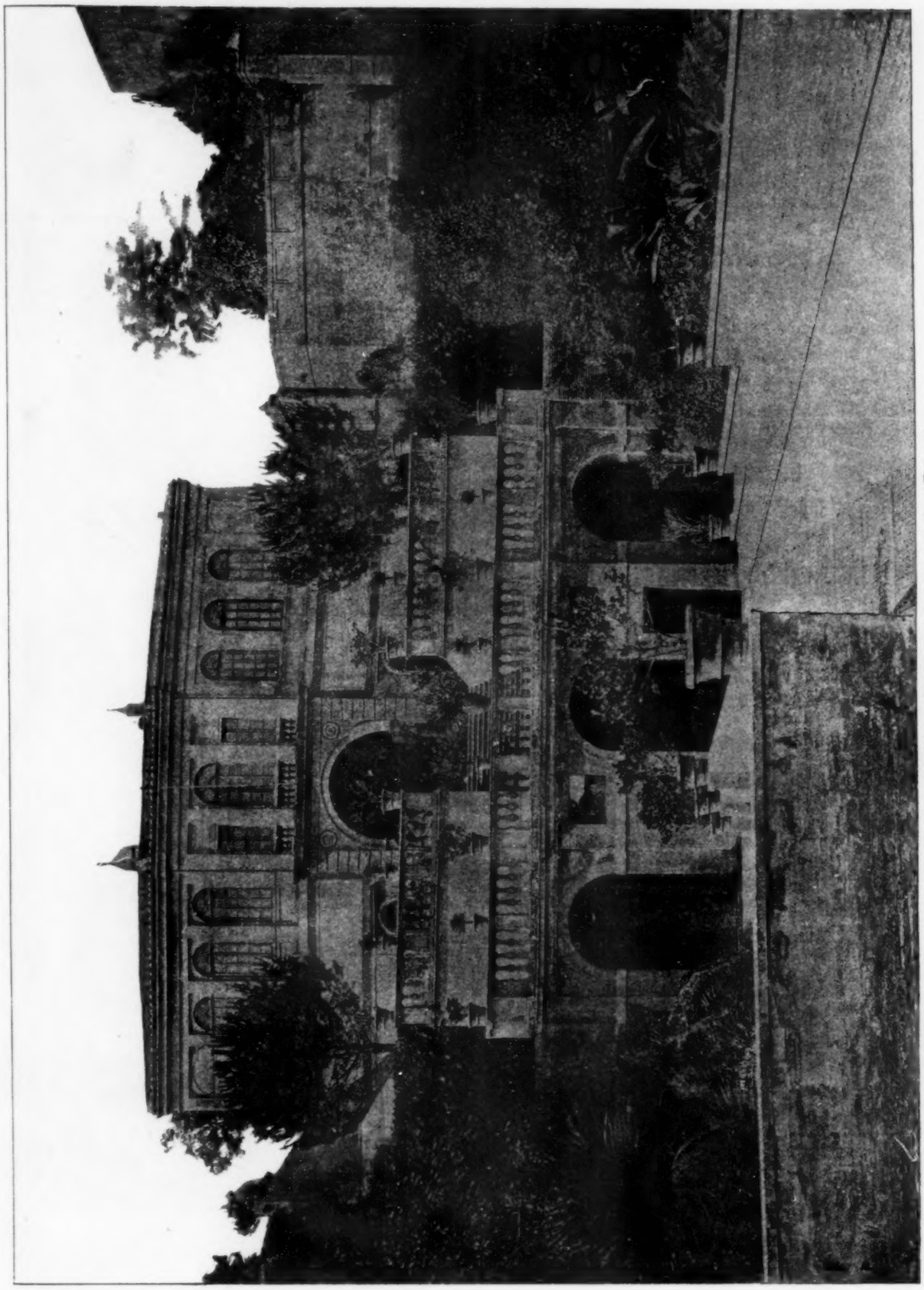

A MODERN PALACE · GENOA, ITALY

Building of the NEW YORK LIFE INSURANCE Co.
MONTREAL, CANADA.
BABB, COOK & WILLARD, ARCHITECTS.

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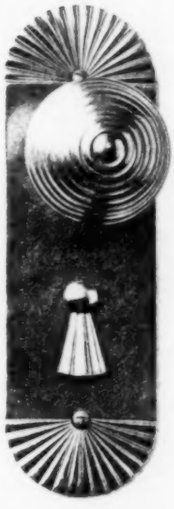

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ARTISTIC HARDWARE

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Residence for
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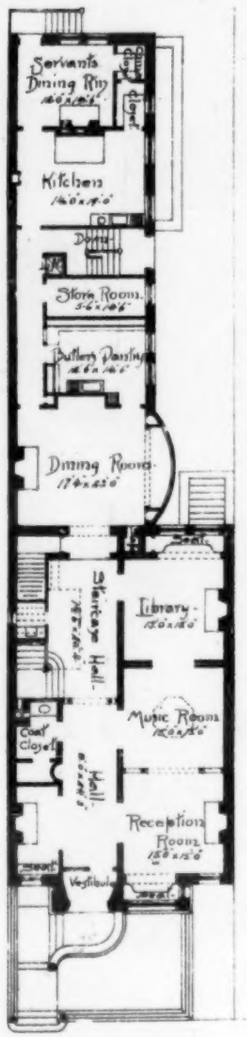
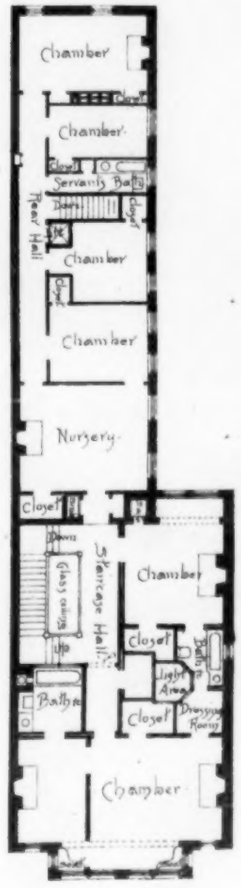


First Floor Plan

H. E. Siter.
Architect Cincinnati O

United Bank Bldg.



Second Floor Plan

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